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Comparison of Houtman's Declinations for Epoch A.D. 1600—continued.

Star.	Houtman.		Neugebauer.		N.–H.
	°	′	°	′	′
ι^1 Scorpii	39	50	39	53	− 3
ζ Aræ	54	40	55	14	−34
β ,,	55		55	2	− 2
α ,,	49	38	49	26	+12
α Pavonis	58	14	57	55	+19
α Gruis	49		48	51	+ 9
β ,,	−49		−48	57	+ 3

The Number of Stars of Different Magnitudes in the Hyderabad Astrographic Catalogue, Zone −17°. By R. J. Pocock, B.A., B.Sc.

1. The first volume of the *Hyderabad Astrographic Catalogue*, containing the diameters and measured co-ordinates of over 63,000 stars on plates with centres approximately in Decl. − 17°, is now completed. The numbers of stars recorded under different diameters have been counted, and the results are discussed in the present note. As the printing of the volume is not yet complete, it may be best to begin with a brief description of the Hyderabad practice in determining diameters.

2. As each star is measured an estimate of the diameter is made and entered on the measure sheets. Since each star is measured twice in different positions of the plate; two estimates of the diameter are made, and these are added together and the sum printed in the catalogue under the heading d (thus following the Greenwich plan). In order to convert these numbers into magnitudes a formula of the form $m = a - b\sqrt{d}$ has been adopted, since other observatories have found such a formula suitable. The numbers of stars of each tenth of a magnitude among the reference stars used for this zone, taken from the *Washington A.G. Catalogue*, were counted, and by means of these counts the Washington magnitudes were converted to a scale comparable with that of Chapman and Melotte.* These modified magnitudes (m) were then compared with the diameters (d) separately for each plate, and hence the constants a, b determined. Several different groups of plates gave values of b all close to 1·09, which was therefore adopted for the whole zone, and the values of a determined separately for each plate. The resulting formulæ, however, very often result in giving much too faint a magnitude for the fainter stars on the plate. This is due to the fact that most of the measurers used in reality two distinct scales, one for the bright stars and another for the faint stars, estimating all the stars as over 20 or under 10 say, with very few between, so that a formula determined

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* See *Astronomical Journal*, vol. xxix., No. 688.

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from the bright stars alone necessarily makes the faint stars too faint, and *vice versa*. We shall have evidence of this fact later. Another peculiarity is that some of the measurers estimate a very large proportion of their stars as 4 or 5 (printed as 8 or 9); on the other hand, other measurers go to the other extreme, and never use these low numbers at all. Since there were five different measurers working throughout, and six towards the end of the work, and the work of the different measurers is well mixed up in each part of the zone, this can have little effect on the final counts.

3. Since one of the objects of this paper is to look for discontinuities in the ratio of faint to bright stars, it is well to consider first what artificial discontinuities may exist, owing to seasonal changes, etc. The zone here considered is particularly favourable for such a consideration; the whole work occupied just two years (1914 Dec.–1916 Dec.), and only two different batches of plates were used. In the earlier part of the work (1914 Dec.–1915 May) the plates used belonged to an old batch that had been in India for some considerable time, and had lost much of their sensitiveness. The exposures given were at first fifteen minutes, and towards the end of this period were increased to eighteen and in a few cases to twenty minutes. All the plates from three hours to ten hours belong to this group, as also a few plates outside these limits of R.A. Since this region was taken within a comparatively short period of time and with similar plates, there is little likelihood of the artificial introduction of any discontinuity in the series. With a few exceptions (mostly in $11^h - 13^h$) all the plates from 10^h to 3^h were taken between 1916 March and 1916 December with a different batch of plates. A few of these newer plates were given an exposure of fifteen minutes, but as they were found to be much more rapid than the older ones, the exposure was soon diminished to twelve minutes. The great majority of these plates were exposed during the period 1916 March 1–1916 May 7, while of the plates exposed later in the year, most were exposed in October–November. Hence here again there is very little chance of any discontinuity. It is true that in the period December–March there is a very great rise in temperature, but this occurs slowly and should cause no sudden break. There is, on the other hand, a sudden change about the middle of June, when the monsoon sets in, but in June, July, or August it is very rarely possible to secure plates, and there are very few in this volume taken in these months.

4. Turning to the numbers themselves, and denoting by N_x the number of stars whose recorded diameters (*i.e.* the sum of two estimations) are not less than x, I have tabulated in Table I. the totals for each hour of R.A. of N_{50}, N_{30}, N_{20}, N_{12}, N_8, the latter being equal to the total number of stars measured. Since the hours of R.A. contain alternately eight and seven plates, the numbers have first been multiplied by a factor to make them equivalent to ten plates in each hour of R.A.

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TABLE I.

Cumulative Totals for Ten Plates in each Hour of R.A., Zone − 17°.

R.A. h	N_{50}	N_{30}	N_{20}	N_{12}	N_{8}
0	93	553	909	1413	1940
1	60	379	656	1075	1620
2	53	366	726	1313	1777
3	59	308	729	1272	1665
4	94	353	832	1500	2310
5	248	1121	1841	2694	3270
6	236	1016	2059	3383	4620
7	164	1108	3100	6401	10720
8	123	724	1554	3067	5220
9	79	378	871	1610	2750
10	51	259	554	1116	1966
11	51	252	581	1182	2341
12	69	316	613	1249	1974
13	100	434	799	1520	2799
14	107	637	1180	2044	3990
15	106	514	1151	2220	4236
16	119	494	821	1490	2917
17	182	739	1356	2720	5910
18	110	611	1214	2490	6167
19	91	330	1046	2189	5282
20	89	587	1206	2273	4034
21	108	708	1146	1864	2620
22	87	429	820	1376	2203
23	64	446	789	1261	1861
C. and M. Mag.	9·14	10·77	11·55	12·25	12·94
Calcd.	9·16	10·62	11·51	12·40	12·95
Diff.	−·02	+·15	+·04	−·15	−·01

5. The most noticeable feature about the table is the sudden very large increase in the star density between 6^h and 7^h, which, moreover, the table shows is entirely due to the fainter stars. At the foot of each column is given the corresponding magnitude on the C. and M. scale, determined from the table in *Monthly Notices*, vol. lxxv. p. 145. Below these are given the magnitudes calculated from the formula $m = 15{\cdot}44 - 0{\cdot}88\sqrt{d}$. Now the value of b, viz. 0·88 in this formula, is sensibly different from that mentioned above, viz. 1·09, adopted for the whole zone. It will be seen that the formula just given suits very well both for faint and bright stars, whereas if we use the value 1·09 and only take account of the bright stars we obtain the formula $16{\cdot}92 - 1{\cdot}09\sqrt{d}$, which will

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make the faint stars 13·84 instead of 12·95, nearly a whole magnitude too faint; this is an instance of the fact mentioned above, that the bright stars are estimated too bright relatively to the faint stars. The formulæ given in the printed volume must therefore be considered as only suitable for the bright stars; at about mag. 11·0 they will make the stars 0·5 mag. too faint, and below 12·0, 0·9 mag. too faint.

6. Next, taking the logarithms of the numbers in Table I. and treating them in the same way as Professor Turner has done in several papers (see *Monthly Notices*, lxxv. p. 63), that is, subtracting the mean of each column from each number in the column and then subtracting one column from the remainder, we form Table II. Since the column N_{30} has been taken as standard and subtracted from the remainder, this column is omitted, and the signs of the column headed N_{50} are changed so as to be comparable with the other columns.

Table II.

Values of log N' to log N'_{30} for Selected Magnitudes in Units of 0·01.

R.A. h	N_{50}	N_{20}	N_{12}	N_8	Gal. Lat.
0	− 6	− 9	−16	−25	−77
1	− 9	− 7	−11	−16	−75
2	−13	− 1	− 1	−11	−64
3	0	+ 7	+ 4	− 6	−51
4	+14	+ 6	+ 6	+ 2	−38
5	+ 6	− 9	−19	−33	−24
6	+ 8	0	− 4	−14	−11
7	−11	+14	+20	+19	+ 1
8	− 6	+ 2	+ 6	+ 6	+14
9	+ 3	+ 6	+ 6	+ 7	+25
10	+ 1	+ 2	+ 7	+ 9	+35
11	+ 2	+ 6	+10	+17	+42
12	+ 5	− 2	+ 3	0	+45
13	+ 8	− 4	− 2	+ 2	+44
14	− 6	− 4	− 6	0	+39
15	+ 3	+ 4	+ 7	+12	+31
16	+10	− 8	− 9	− 2	+20
17	+10	− 4	0	+11	+ 8
18	− 3	− 1	+ 4	+21	− 4
19	+16	+20	+26	+41	−17
20	−11	0	+ 2	+ 4	−30
21	−10	−10	−15	−23	−43
22	+ 2	− 2	− 6	− 8	−57
23	−13	− 6	−12	−17	−69

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Looking at the column headed N_8, it is at once evident why the lines have been drawn separating the region 7^h to 20^h from the rest. We have here a discontinuity similar to those found by Professor Turner in other zones. Following Professor Turner, I shall speak of the region 7^h to 20^h as unobscured, and of the region 21^h to 6^h as obscured, simply for convenience, without intending to imply that the difference is necessarily due to any actual obscuring matter in space. It may be noted that the obscured region from 21^h to 6^h fits very well into the diagram given by Professor Turner in *Monthly Notices,* lxxv. p. 480.

7. Now, taking the numbers given in Table I. and multiplying by such factors as to reduce the total number of stars in each hour of R.A. to about 2000, we can determine the amount of the obscuration without giving undue weight to the galactic regions. Without giving the details, we arrive at the results shown in Table III., where I., II. are the obscured and unobscured regions respectively. Table III. is similar in form to Tables V., VII., XIII., XIV. in *Monthly Notices*, lxxv. p. 470. In this case log N_{50} has been subtracted from the other logarithms.

TABLE III.

Amount of Obscuration, Zone – 17°. *Logarithms in Units of* 0·01.

Mag.	9·14.	10·77.	11·55.	12·25.	12·94.
I.	867	3788	3878	5645	5774
II.	742	2924	4020	7288	13318
log I.	0	64	65	82	83
log II.	0	60	73	99	125
log I.-II.	0	+4	–8	–17	–42

8. It will be seen that the final figure comes out –42 in exact agreement with the number found in other zones; and, comparing the amount of obscuration with the two adjacent zones as given in *Monthly Notices*, lxxv. p. 480, we get—

Mag.	10·0.	11·5.	13·0.
Algiers – 1°	–10	–18	–42
Hyderabad – 17°	0	– 7	–42
Perth – 32°	0	0	–42

So that the Hyderabad results fall naturally between the other two. In the Hyderabad zones the obscuration begins about 11·0.

9. Now, arranging the numbers of Table II. according to galactic latitude, we obtain the results shown in Table IV.

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TABLE IV.

Amount of Galactic Condensation.

Obscured Region.						Unobscured Region.					
Mean Gal. Lat.	No. in Group.	9·14.	11·55.	12·25.	12·94.	Mean Gal. Lat.	No. in Group.	9·14.	11·55.	12·25.	12·34.
−71°	4	−10	−6	−10	−17	+41°	5	+2	0	+2	+6
−50°	3	−3	−2	−6	−12	±25°	5	+4	+4	+6	+12
−24°	3	+9	−1	−3	−15	±70°	4	−2	+3	+8	+14

10. Determining the coefficient of galactic condensation per magnitude per degree from the first and last rows only, and in each case taking the simple mean of the four determinations, we have the result—

Coefficient of galactic condensation.

Unobscured region −·00065. Obscured region −·00142.

The first result falls between those for Algiers and Perth, the second is slightly larger than either Algiers or Perth (see *Monthly Notices*, lxxv. p. 608). They do not lend support to the unusually high value in the case of the Cape Zone −41°. The mean value −·00104, however, lends some support to the suggestion that there is an increase in the amount of galactic condensation as we proceed southwards.

Nizamiah Observatory, Hyderabad:
1917 *January* 17.

Errata in the Double-Star Measures of the "Monthly Notices," Volumes LXVI. to LXXV. By Eric Doolittle.

In the course of copying all the double-star measures published in the *Monthly Notices* for the past ten years, the following errors have been detected. It is hoped that this list is an exhaustive one: perfectly obvious misprints, such as can cause no inconvenience, are, however, for brevity, not referred to.

Volume LXVI.

Royal Observatory, Greenwich.

Page 24. Ho 57, BC. Apparently this may be some other pair.
„ 26. Hu 482. Apparently the wrong star. The measures describe β 1115, and may belong to this.
„ „ Hu 483. Apparently the wrong star; (= See 277 ?).